A portion of this water would be further treated to high purity for use in the closed steam cycle portion of the plant. This treatment would be accomplished through coagulation of suspended solids using ferric chloride, filtering though sand and cartridge filters, and passage through a reverse osmosis system, which employs a semipermeable membrane to remove the smallest particles and much of the remaining dissolved matter. The water would be finally treated in a demineralizer to remove the remaining dissolved matter. This water would provide makeup water in the steam cycle as well as potable water for the plant.

Three main waste streams would be piped into the waste sump during normal power plant operation. Waste streams would mix before being discharged untreated into a drainage channel that would eventually lead to the New River. The first stream would be the wastewater from the cooling tower. The cooling tower bank would consist of 12 units, and the water would be used for up to six cycles before it was discharged. The second stream would be wastewater from the demineralization process. The third stream would be water discharged from the steam cycle.

At times when the TDM power plant is not producing energy under normal conditions, the sewage treatment plant would operate in the bypass mode; that is, water from the Zaragoza Oxidation Lagoons would be treated in the biological treatment portion of the sewage treatment plant and then be discharged into the drainage channels. This would be necessary because the biological treatment part of the sewage treatment plant must operate at all times to maintain the microorganisms in the biological reactor. If the microorganisms would die, the sewage treatment plant would require 4 to 6 weeks to restart operations.

2.3 ALTERNATIVE TECHNOLOGIES

Under this alternative, DOE and BLM would grant one or both Presidential permits and corresponding ROWs to applicants who would build transmission lines that connect to power plants that would employ more efficient emissions controls and alternative cooling technologies.

The alternative cooling technologies considered under this alternative are dry cooling and wet-dry cooling. Under the proposed action alternative, both power plants would use SCR technology to reduce NO_x emissions. Only one power plant would use oxidizing catalysts to reduce CO emissions. Thus, this alternative includes operation of two power plants utilizing SCR and oxidizing catalyst technologies on all turbines.

2.3.1 Cooling Technologies

This section provides a general description of the dry and wet-dry cooling technologies that will be analyzed in this EIS as alternative technologies.

2.3.1.1 Dry Cooling

There are two types of dry cooling systems: direct dry cooling and the lesser-used indirect dry cooling. In both systems, fans blow air over a radiator system to remove heat from the system via convective heat transfer (rather than using water for cooling or evaporative heat transfer). In the direct dry cooling system, also known as an air-cooled condenser system, steam from the steam turbine exhausts directly to a manifold radiator system that releases heat to the atmosphere, condensing the steam inside the radiator. Figure 2.3-1 is a schematic of a direct dry cooling system.

Indirect dry cooling uses a secondary working fluid (in a closed cycle with no fluid loss) to help remove the heat from the steam. The secondary working fluid extracts heat from the surface condenser and flows to a radiator system that is dry cooled (fans blow air through the radiator to remove heat from the working fluid). An indirect dry cooling system is more complex and less efficient than a direct dry cooling system; for this reason it is also less common. An indirect dry cooling system also produces no environmental advantages over a direct dry cooling system. For these reasons, this EIS only considers a direct dry-cooling system.

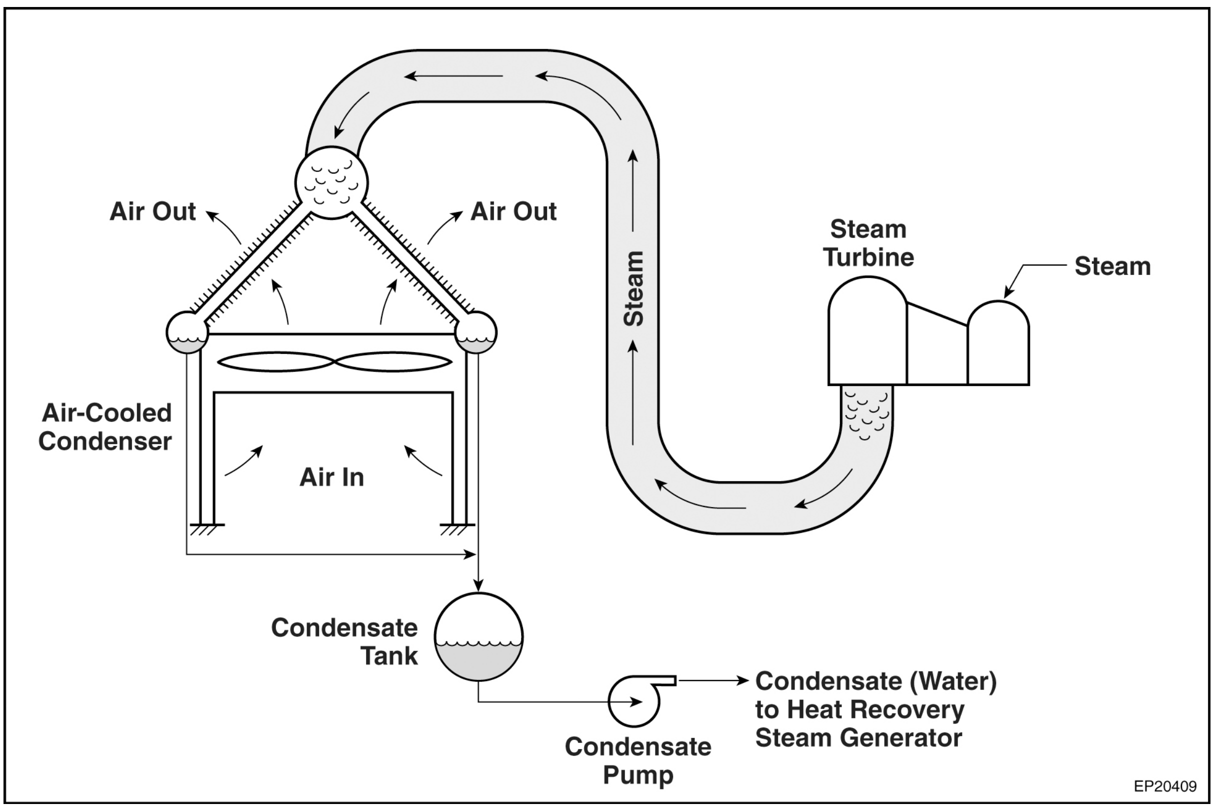

FIGURE 2.3-1 Dry Cooling Technology (Source: adapted from CEC 2001)

Advantages of dry cooling, relative to wet cooling, may include the following:

- Significant decrease in water required for dry cooling compared with wet cooling. Typically, dry cooling systems use 90 to 95% less water than power plants with wet cooling systems.

- Minimal use of water treatment chemicals, since air is used in the air-cooled condenser and not water like in the wet cooling tower.

- Minimal generation of liquid and solid wastes, since water impurities requiring disposal are not generated in the air-cooled condenser as they are in a wet evaporative cooling tower.

- No visible water vapor plume, which is present with wet cooling technology during certain meteorological conditions.

- Lower water consumption, that is, 90 to 95% less water would be purchased and treated.

The following disadvantages may be associated with dry cooling:

- Air-cooled condensers can have a negative visual effect because they are often taller than wet cooling towers.

- Decreased efficiency in hot weather compared with wet evaporative cooling.

- Disturbance of a larger land area for the air-cooled condensers than is required for wet cooling towers.

- Greater noise impacts than wet cooling systems because of the greater number of fans and the considerably greater total airflow rate. However, new quieter fans and other mitigation measures are available to reduce these impacts.

- A 10 to 15% reduction in power plant steam-cycle efficiency and output, depending on site conditions and seasonal variations in ambient conditions. Also, extra power is needed to operate the cooling fans.

- Increased capital and operating and maintenance costs for building a dry cooling system compared with a wet cooling system.

2.3.1.2 Wet-Dry Cooling

Wet-dry cooling systems combine wet and dry cooling technologies (Figure 2.3-2). A wide range of system designs is possible, covering the entire spectrum of wet versus dry cooling

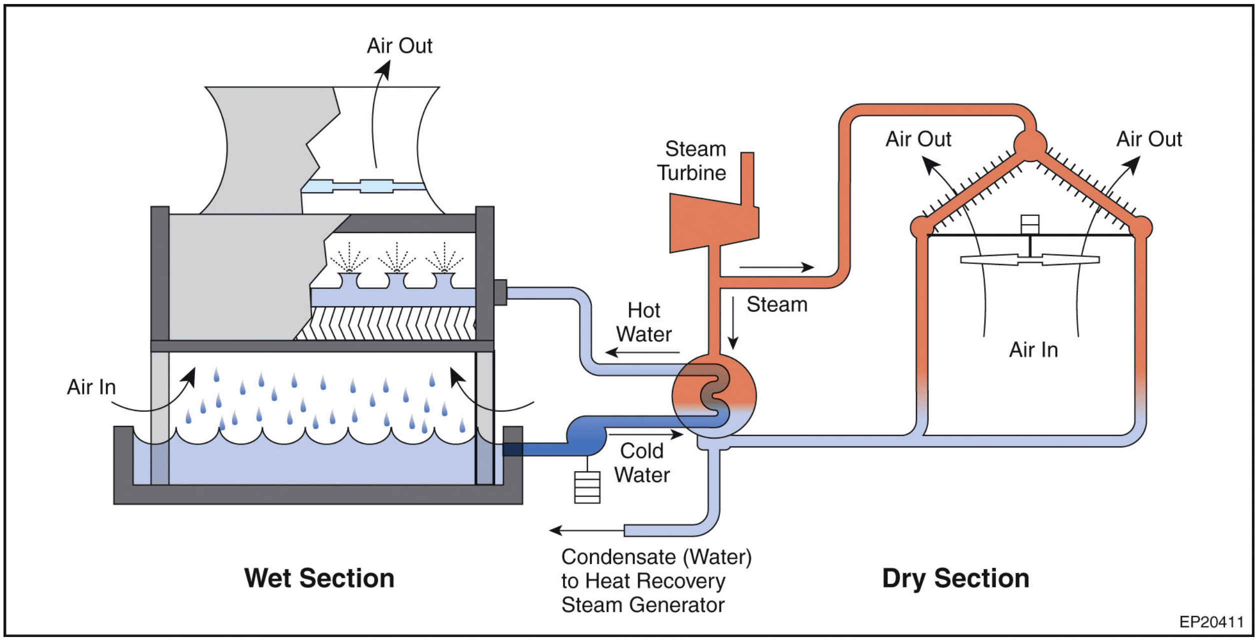

FIGURE 2.3-2 Wet-Dry Cooling Technology (Source: adapted from Institute of Clean Air Companies 1997)

components depending on plant needs. A typical wet-dry cooling system would utilize both an air-cooled condenser and a wet evaporative cooling tower within the same cooling system. A typical wet-dry cooling system would achieve a ratio of wet-to-dry cooling on the order of 50%. Ratios can vary, however, on the basis of ambient air temperatures and humidity. A wet-dry system is sometimes called a “water conservation design,” or a “parallel condensing cooling system.” Wet cooling would be used during hot weather, while dry cooling would be used most other times.

Application of a wet-dry cooling system allows tailoring the use of either the wet or dry system on the basis of climatic conditions. However, use of such a system entails increased capital and maintenance costs compared with either wet or dry cooling systems, since two systems are needed.

2.3.2 Air Emissions Control Technologies

This alternative includes operation of two power plants equipped with SCR and the use of oxidizing catalysts on all gas turbines.

The following is a description of a generic CO control system. CO is emitted when natural gas is not combusted completely. CO emissions in power plants are often controlled with an oxidizing catalyst. A honeycomb-like structure containing the catalyst is placed in the flue gas ductwork. The catalyst is made of precious metals, such as platinum and palladium, which act to promote a chemical reaction to transform CO to carbon dioxide (CO_2). This system can also reduce other hydrocarbons caused by incomplete combustion. These hydrocarbons combine with oxygen to form water and CO_2. For effective reduction of CO and hydrocarbons, the flue gas must be lean (i.e., have excess oxygen) to promote the reactions.

2.4 MITIGATION MEASURES

Under this alternative, DOE and BLM grant one or both Presidential permits and corresponding ROWs to authorize transmission lines whose developers would employ off-site mitigative measures to minimize environmental impacts in the United States. The mitigation measures addressed under this alternative pertain only to offsets of air emissions from power plant operation. DOE contacted the Imperial County Air Pollution Control Office and the Border Power Plant Working Group to obtain suggestions for off-site mitigation measures that could be evaluated under this alternative (Russell 2004; Pioriez 2004a,b,c; Pentecost and Picel 2004; Powers 2004). Additional mitigation measures to replace water reductions were not analyzed because all available water in California is committed to other uses (Colorado River Board of California 2000). Also, the Imperial Irrigation District (IID), the state agency that is presently addressing water use issues in the Salton Sea Watershed, currently has a monitoring and mitigation program to respond to such issues.

For air quality, the mitigation measures can be evaluated on a per-unit or individual project basis. The evaluation of impacts includes examples of reductions in PM_{10} and NO_x emissions that could occur as a result of updating engines in agricultural and transportation equipment and use of more efficient, newer automobiles. These examples could be assembled into a program that would mitigate impacts from emissions from the developers' power plants. The EIS evaluates possible elements of such a program, but does not specify combinations of elements.

The following mitigation measures identified by the Imperial County Air Pollution Control Office are also considered under this alternative. None of the measures, individually or collectively, would be able to offset the total quantities of PM_{10} or gaseous emissions produced by the power plants. However, implementation of one or more of these measures would serve to improve air quality in Imperial County. Later sections describe potential offsets in the Mexicali region.

- Paving of Roads: The Imperial County Public Works Director provided the Imperial County Air Pollution Control Office with a list of about 50 road segments totaling 22 mi (37 km) that could be paved to reduce fugitive dust emissions.

- Retrofitting of Emission Controls on IID Power Plants: The Imperial County Air Pollution Control Office suggested that SCR installation on IID steam plant Unit 3 and the peaker plants would reduce NO_x emissions in the project area.